

BRUSHLESS DC MOTOR

ABSTRACT OF THE DISCLOSURE

A system and method for reducing the cost of producing a brushless DC motor (58) is presented. The brushless DC motor (58) provides higher power density and efficiency with an increased tool run time. The brushless DC motor (58) includes a rotor assembly (72) that has an unmagnetized permanent magnet (74) affixed to a shaft. The permanent magnet (74) remains unmagnetized until the motor is partially assembled. A plurality of coils (94) for producing a magnetic field are wound about the rotor assembly (72). The coils (94) include end turns that enclose the rotor assembly (72) such that the rotor assembly (72) is not removable. Since the windings (94) are wound with the rotor assembly (72) already enclosed, the windings (94) do not require large end coils to allow subsequent insertion of the rotor (72). Minimizing the end coils reduces the length of wire required per turn, thereby reducing the resistance of the winding (94). Also, since the permanent magnet (74) is unmagnetized when the coils (94) are wound around the rotor assembly (72) the winding process is simplified by not coupling energy into the wire which would influence the winder operation. The wound assembly is inserted into a stator stack (96) comprised of magnetic material that provides a magnetic flux return path for the magnetic flux generated by the permanent magnet (74). Using an unmagnetized permanent magnet (74) facilitates easy insertion of the wound assembly into the stator stack (96), reduces the accumulation of magnetic debris during the manufacturing process, and permits the motor assembly to be sealed prior to magnetizing the permanent magnet (74).